liquid crystal display.

80. (New) A method according to claim 37 wherein said semiconductor device is a liquid crystal display.

81. (New) A method according to claim 41 wherein said semiconductor device is a liquid crystal display.

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82. (New) A method according to claim 53 wherein said semiconductor device is a liquid crystal display.

83. (New) A method according to claim 55 wherein said semiconductor device is a liquid crystal display.

84. (New) A method according to claim *58* wherein said semiconductor device is a liquid crystal display.--

add G19

REMARKS

Applicants wish to thank the Examiner for the very thorough consideration given the present application. The Office Action of **February 6, 2001** has been received and its contents carefully noted. Filed concurrently herewith is a *Request for a One (1) Month Extension of Time* that extends the shortened statutory period for response to **June 6, 2001**. Accordingly, Applicants respectfully submit that this response is timely filed.

Claims 1-19, 21-24 and 26-64 were pending in the present application prior to the aforementioned amendment. Due to the above actions, claims 1-11, 44, 45 and 62-64 have been canceled without prejudice, claims 12, 18, 23, 29, 34, 37, 41, 53, 55 and 58 have been amended and new claims 65-84 have been added to better encompass the full scope and breadth of the

invention notwithstanding, Applicants believe that the claims would have been allowable as originally filed. Accordingly, Applicants assert that no new matter has been added and that the claims have not been narrowed within the meaning of *Festo*. Accordingly, claims 12-19, 21-24, 26-43, 46-61 and 65-84 are now pending in this application and are believed to be in condition for allowance for the reasons advanced below.

Initially, the *Office Action* rejects claims 1-3, 5-9, 11-15, 17, 23-24, 26, 28-31, 33-39, 41-46 and 48-61 under 35 USC §103(a) as being unpatentable over ***Chang '775*** in view of ***Wolf et al.***, claims 4, 10, 16, 18-19, 21-22, 27, 32, 40 and 47 under 35 USC §103(a) as being unpatentable over ***Chang '775*** in view of ***Wolf et al.*** and ***Han et al. '118***, claims 63-64 under 35 USC §103(a) as being unpatentable over ***Chang '775*** in view of ***Wolf et al.*** and ***Chiyuukou*** (JP 02-224253) and claim 62 under 35 USC §103(a) as being unpatentable over ***Chang '775*** in view of ***Wolf et al.***, ***Han et al. '118*** and ***Chiyuukou*** (JP 02-224253). These rejections are respectfully traversed for the following reasons and favorable consideration is kindly solicited in view thereof. Applicants hereby incorporate by reference the arguments previously solicited during the prosecution of the subject application.

The claimed invention is directed generally to a method for fabricating a semiconductor device comprising the steps of forming an amorphous semiconductor film on an insulating surface, forming an insulating film over the semiconductor film, introducing an impurity such as boron into at least a portion of the semiconductor film and through the insulating film, crystallizing the semiconductor film using laser irradiation and removing the insulating film.

As the Examiner well knows, three criteria must be met to establish a *prima facie* case of obviousness. *M.P.E.P.* §2143. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings to achieve the claimed invention. *Id.* Second, there must be a reasonable expectation of success. *In re Rhinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976). Third, the prior art must teach or suggest all the claim limitations. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974).

Applicants respectfully submit that the Office Action fails to set forth a *prima facie* case of obviousness based upon the applied references, and that the claimed invention is patentably distinct over the prior art of record. More particularly, Applicants respectfully contend that the proposed ***Chang*** modifications fail to expressly teach or implicitly suggest at least a step of introducing an impurity such as boron into at least a portion of said semiconductor film through an insulating film, as set forth at least in independent claims 12, 18, 23, 29, 34, 37, 41, 53, 55 and 55 of the claimed invention. For instance, while the ***Chang '775*** patent appears to disclose the formation of a semiconductor layer 34 on an insulating surface 32, it expressly discloses at least on column 3, lines 19-22 and column 4, lines 17-26 that boron 36 is introduced into the semiconductor layer 34, and thus, fails to specifically disclose or implicitly suggest introducing an impurity such as boron through an insulating film. This is more evident from the fact that the ***Chang '775*** patent discloses at least on column 3, lines 40-50 that an insulating layer 40 is formed subsequent to the step of introducing boron, whereas the claimed invention requires forming the insulating film on the semiconductor film prior to the step of introducing boron.

Moreover, the proposed ***Chang '775*** modification fails to expressly disclose or implicitly suggest a method for fabricating a semiconductor device comprising a step of crystallizing the semiconductor film by laser irradiation through the insulating film, as set forth at least in independent claims 12, 18, 23, 29, 34, 37, 41, 53, 55 and 55 of the claimed invention. More particularly, the ***Chang '775*** patent teaches away from the claimed invention in disclosing a step of crystallizing the semiconductor layer 34 through an annealing process at a temperature of between 600°C to 1000°C (Col. 3, lines 51-62). Accordingly, the presently claimed invention would not have resulted even if one skilled in the art would have combined the teachings of the base ***Chang '775*** reference with the teachings of the ***Wolf et al.***, ***Han et al. '118*** or ***Chiyuukou*** patents.

Moreover, there is a lack of suggestion as to why a skilled artisan would use the proposed ***Chang*** modification to achieve the unobvious advantageous properties first recognized by Applicants. "The mere fact that references can be combined or modified does not render the

resultant combination obvious unless the prior art also suggests the desirability of the combination." *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990).

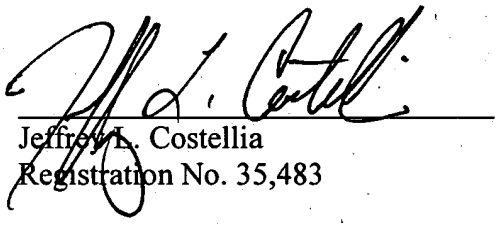
In the claimed invention, the insulating film not only functions to provide a desirable concentration of boron in the semiconductor film (as shown in Exhibit A submitted on June 7, 2000), but also functions to improve the crystal growth of the semiconductor layer. Moreover, the use of irradiated laser light to crystallize the semiconductor film is particularly advantageous when placed in combination with the aforementioned features since they each provide a method of fabricating a semiconductor device that results in a device having enhanced electrical characteristics such as high mobility. A semiconductor device having high mobility is advantageous since it allows for high speed operation of the TFTs, which is a desirable feature in conventional TFTs.

There is a lack of suggestion in the proposed ***Chang '755*** modifications that would motivate one skilled in the art to combine their respective teachings to the claimed invention. For instance, the benefits derived from the practice of the claimed invention cannot be obtained using any of the proposed ***Chang '755*** modifications since the resultant combination teaches the use of a conventional high-temperature process such as annealing (and not by laser irradiation), and specifically discloses crystallizing the semiconductor layer at a temperature of between 600°C to 1000°C (*See* ***Chang '755,*** col. 3, lines 51-62). Accordingly, it is respectfully submitted that the proposed ***Chang '755*** modifications fail to recognize the unobvious advantageous properties of the claimed invention. This failure to recognize the advantageous features set forth in the claimed invention is probative as to the nonobviousness of the subject invention. Consequently, since the proposed ***Chang '755*** modifications fail to teach or suggest all the claim limitations, and also fails to teach or suggest the unobvious advantageous properties resulting therefrom, Applicants respectfully request that the claimed invention is patentably distinct over the prior art.

Accordingly, Applicants respectively contend that the claimed invention is directed to subject matter which is patentably distinct over the prior art and also submit that the pending claims are in proper condition for allowance and reconsideration and withdrawal is requested. If

the Examiner believes further discussions with Applicants' representative would be beneficial in this case, he is invited to contact the undersigned.

Respectfully submitted,



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Marked-copy of amended claims.

12. (Amended) A method for fabricating a semiconductor device, comprising the steps of:

forming a semiconductor film comprising amorphous silicon on an insulating surface;

forming an insulating film on said semiconductor film;

introducing boron into at least a portion of said semiconductor film though said insulating film, said portion to become at least a channel region;

crystallizing said semiconductor film by laser irradiation through said insulating film;

removing said insulating film;

forming a gate insulating film on said semiconductor film;

forming a gate electrode on said gate insulating film, said gate electrode having tapered side edges; and

forming source and drain regions in said semiconductor film by ion doping through said gate insulating film.

18. (Amended) A method for fabricating a semiconductor device, comprising the steps of:

forming a semiconductor film comprising amorphous silicon on an insulating surface;

forming an insulating film on said semiconductor film;

introducing boron into at least a portion of said semiconductor film through said insulating film, said portion to become at least a channel region;

crystallizing said semiconductor film by laser irradiation through said insulating film;

removing said insulating film;

forming a gate insulating film on said semiconductor film;

forming a gate electrode on said gate insulating film, said gate electrode having tapered side edges; and

forming source and drain regions in said semiconductor film by ion doping.

23. (Amended) A method for fabricating a semiconductor device, comprising the steps of:

forming a semiconductor film comprising amorphous silicon on an insulating surface;

forming an insulating film on said semiconductor film;

introducing boron into at least a portion of said semiconductor film though said insulating film, said portion to become at least a channel region;

crystallizing said semiconductor film by laser irradiation through said insulating film;

removing said insulating film;

forming a gate insulating film on said semiconductor film;

forming a gate electrode on said gate insulating film; and

forming source and drain regions in said semiconductor film by ion doping which is performed through said gate insulating film.

29. (Amended) A method for fabricating a semiconductor device, comprising the steps of:

forming a semiconductor film comprising amorphous silicon on an insulating surface;

forming an insulating film on said semiconductor film;

introducing boron into at least a portion of said semiconductor film through said insulating film, said portion to become at least a channel region;

crystallizing said semiconductor film by laser irradiation through said insulating film;

removing said insulating film;

forming a gate insulating film on said semiconductor film;

forming a gate electrode on said gate insulating film; and

forming source and drain regions in said semiconductor film by ion doping.

34. (Amended) A method for fabricating a semiconductor device, comprising the

steps of:

forming a semiconductor film on an insulating surface;

forming an insulating film on said semiconductor film;

introducing boron into at least a portion of said semiconductor film through said insulating film, said portion to become at least a channel region;

crystallizing said semiconductor film by laser irradiation through said insulating film;

removing said insulating film;

forming a gate insulating film on said semiconductor film;

forming a gate electrode on said gate insulating film; and

forming source and drain regions in said semiconductor film by ion doping.

37. (Amended) A method for fabricating a semiconductor device, comprising the steps of:

forming a semiconductor film on an insulating surface;

forming an insulating film on said semiconductor film;

introducing boron into at least a portion of said semiconductor film through said insulating film, said portion to become at least a channel region;

crystallizing said semiconductor film by laser irradiation through said insulating film;

removing said insulating film;

forming a gate insulating film on said semiconductor film;

forming a gate electrode on said gate insulating film, said gate electrode having tapered side edges; and

forming source and drain regions in said semiconductor film by ion doping.

41. (Amended) A method for fabricating a semiconductor device, comprising the steps of:

forming a semiconductor film on an insulating surface;

forming an insulating film on said semiconductor film;

introducing boron into at least a portion of said semiconductor film through said insulating film, said portion to become at least a channel region;

crystallizing said semiconductor film by laser irradiation through said insulating film;

removing said insulating film;

forming a gate insulating film on said semiconductor film;

forming a gate electrode on said gate insulating film;

forming source and drain regions in said semiconductor film by ion doping through said gate insulating film.

53. (Amended) A method for fabricating a semiconductor device, said semiconductor device having at [lest] least one thin film transistor comprising a semiconductor film formed adjacent to a gate electrode with a gate insulating film therebetween, said method comprising the steps of:

forming said semiconductor film over a substrate;

forming an insulating film on said semiconductor film;

introducing boron into at least a portion of said semiconductor film through said insulating film, said portion becoming at least a channel region of said thin film transistor; [and]

crystallizing said semiconductor film by laser irradiation through said insulating film; and

removing said insulating film.

55. (Amended) A method for fabricating a semiconductor device, said semiconductor device having at least one thin film transistor comprising a semiconductor film formed adjacent to a gate electrode with a gate insulating film therebetween, said method comprising the steps of:

forming said semiconductor film over a substrate;

forming an insulating film on said semiconductor film;

introducing boron into at least a portion of said semiconductor film through said

insulating film, said portion becoming at least a channel region of said thin film transistor;

crystallizing said semiconductor film by laser irradiation through said insulating film;

removing said insulating film; and

forming source and drain regions in said semiconductor film by ion doping.

58. (Amended) A method for fabricating a semiconductor device, said semiconductor device having at least one thin film transistor comprising a crystalline semiconductor film formed adjacent to a gate electrode with a gate insulating film therebetween, said method comprising the steps of:

forming a semiconductor film comprising amorphous silicon over a substrate;

forming an insulating film on said semiconductor film;

introducing boron into at least a portion of said semiconductor film through said insulating film, said portion becoming at least a channel region of said thin film transistor;

crystallizing said semiconductor film by laser irradiation through said insulating film;

removing said insulating film; and

forming source and drain regions in the crystalline semiconductor film by ion doping.